THE PRODUCTION OF PIG SUEDE AND NUBUK FOR GARMENTS AND SHOES

服装和鞋用猪麂皮和猎装革的生产

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Introduction

The present and future importance of pig leather in the garment and shoe industry

The relatively stable and favourable price of pigskins in comparison to other types of leather, sheep, goat, cow-hide, etc., ensures a promising market outlook for pig suede and nubuk. The world potential in pig slaughterings per year is approx. 700 million. In 1970, the yield of pigskin production was estimated at 160 million. Provided sufficient raw hides exist and this production is maintained, better still substantially increased, the hide price will remain stable and therefore competitive (eg. pig suede in the price range of SFr. 1.80 for poor quality to SFr. 3.20 for top quality). The price difference between poor and top quality justifies concentrated efforts to develop production methods for standardised working procedures in order to achieve high quality. Top quality only ensures continued demand in a highly competitive market.

The potential for pigskin garments in Europe and USA is difficult to estimate. Assuming 500 million people consume 2.5 million leather garments, coats and jackets per year, some 150 million sq. ft. of garment leather are required. For this market, at least 30% or 50 million sq. ft. could be covered by pig suede and nubuk which has its own particular, esteemed, natural leather characteristics.

In addition, there are many more outlets in the market, eg. for shoes, such as the well-known "Hush Puppies" for leisure and daily use, which are made of a highly water and dirt repellent suede. This opens an additional market which requires even larger quantities of pig suede and nubuk for shoes than for garments.

Pig leather, suede, nubuk and nappa could also be used for leather goods such as sport bags, luggage, etc. A well prepared water and dirt repellent suede could also be used for furniture upholstery provided the highest possible quality regarding fastness to light, to dry and wet rubbing, water and dirt repellency are achieved. Chinese pig leather would gain a good market share and a fine reputation if a very pleasing, soft touch and a high silky lustre levelness of shade in the hide, identical colour from hide to hide, and high shade conformity from batch to batch are safeguarded. Since the pigskins at your disposal are of a fine structure there is an excellent chance of achieving this aim. Light and medium weight pigskins would be particularly suitable for garment, upholstery and other leather goods, whereas the heavier grades would be used for shoes.

Pig Leather production
(discussed on the basis of recipe RM-15 CP)

One of the main objects of investigation at the SANDOZ leather laboratories has been pig leather production. Each stage of pig leather production has been examined on pigskins of different origin. The know-how obtained from these investigations is at your disposal but it will require adaptation to your production facilities. Practical trials are recommended to find out step by step how the best results in your tanneries can be achieved. Preliminary investigations on your particular type of pigskin (taking into account the particular wishes of your customers) would be made at our laboratory in order to speed up the complex process of transfering the tanning and dyeing technique.

Let us now go through a pigskin tanning process to produce garment pig suede, garment nubuk, shoe suede and nubuk.

1. Soaking, Liming, Pickle, Tanning and Splitting

1.1. The raw hide

In the slaughter house a modern pull off machine is now used in order to avoid cuts and other damage which occur when scalding and scraping according to traditional methods.

In the USA Patent 3.621.514. Hog Skinning Method 1971, by Kenneth J. Brown, the method is described in detail. Some of the advantages are:

1. the costly process of de-bristling is eliminated
2. the method is more hygienic, safer, more rapid and less expensive and does not require special skill of the operator.
3. There is an increase in the value of the hide, both in quality and yield.
4. The value of the lard is increased. The fat is left intact on the carcass. The hide is removed with a minimum of fat attached to it.

1.2. Preservation

It is important to salt the hide immediately after cooling to avoid putrifaction. Mechanical degreasing on a fleshing machine is essential before final salting for stock piling is carried out. Raw hides should be stored at 4-7°C/39-44.5°F.

1.3. Soaking

The fresher the hide and the better it has been previously degreased machanically, the better reproducible the process will be. After a preliminary washing, a second mechanical degreasing is recommended. Degreasing is improved with special

auxiliary agents of high emulsifying power (RM-3.48). It also speeds up the soaking. The PH of the soaking bath should be raised to 10-10.5 with caustic soda to neutralise free fatty acids. The addition of fungoid enzymes, such as Pellvit KAB (Röhm, Darmstadt, W. Germany) helps to obtain thoroughly soaked hides within a few hours.

Bristle cutting

After the hides have been cleaned by the soaking process, cutting off takes place. As a rule, only the stronger bristles from the back are used. Cutting off (down to 2mm) can be done with an electric or a hand-operated bristle cutting machine. The bristles are then dried and selected mechanically according to length.

1.4. Liming

This important stage of production causes problems. In order to reduce the liming time and achieve high productivity as well as a mellow and open fibre structure in the buti, without unduly loose flancs and neck parts, we decided on a three phase liming process at a temperature of 30-33°C/86-91.5°F:

1st phase

In order to completely destroy the bristles and bristle roots a drum pointing with low swelling using only sodium sulphide is applied. The addition of a very effective degreasing agent (RM 3.48) and a reducing agent, dimethylamine, which keeps the pelt less plumped, speeds up the complete destruction of the bristle roots. - The undestroyed bristle roots can be most disturbing on the finished leather: coming out of the leather on wear, eg. tearing stockings in shoes, etc.

2nd phase

Calcium hydrate and molasses are added to the same bath, the latter to increase the solubility of calcium hydrate. Sodium hydroxide is also added to increase the plumping effect. The chemicals of phase 1 and 2 together produce an aggressive liming. With more resistant hides the second phase with a slow mechanical movement must be prolonged. As a rule, one hour is sufficient, but more time may be necessary for older and heavier raw hides. It should however be borne in mind, that after 6-7 hours at a liming temperature of 33°C/91.4°F, destruction of the belly areas may occur.

3rd phase

250% water is added in order to mellow the liming and increase plumping. A 5 min drumming at 1-2 rpm is carried out every hour for a liming time of 22 to 36 hours which is sufficient for shoe suede, nubuk and leather to be top finished.

The pelts are then rinsed at 30°C/86°F with running water in a separate drum if possible.

1.5. Splitting

Depending on the raw stock weights and type of leather to be produced, the following possibilities for splitting exist:

- A splitting to level the substance, eg. to 2.5 mm
- Selection of leather for garments or shoe suede and nubuk.
- A splitting to 1.2 mm would then be preferable for garments in order to obtain more softness in a shorter reliming time. However, more useful splits may be obtained by splitting to desired substance in the blue state.
- Splitting can also be done in the wet blue, in which case the reliming should be extended by 15-24 hours.

1.6. Reliming

There are 3 possibilities for reliming:

- It can be done in the first lime.
- 1/3 to 1/2 of the first liming liquor, strengthened with calcium hydrate for example, may be used.
- A fresh reliming liquor must be prepared if rinsing of the hides for splitting in another vessel is not possible.

The main components of this liquor are calcium hydrate, glucose, sodium sulphide, dimethylamine and an effective degreasing agent, for reasons explained. The effect is controlled by:

- the specific concentration of the liquor
- the duration of treatment - 10 to 48 hours
- the temperature - 25-35°C/77-95°F,
- mechanical agitation.

Generally, it may be said that longer reliming under mellow liming conditions is favourable for obtaining soft leathers with relatively little fatliquoring. Degreasing in both the lime and relime is possible with suitable degreasing agents.

A fat analysis would determine in which cases an additional degreasing bath can be omitted. The natural fat content should be below 2%.

1.7. Washing

Time, amount of water and intensity of drumming have to be constant. Washing is to be preferred to rinsing with running water because of its better reproducibility and lower water consumption.

1.8. Deliming

Complete deliming is achieved when the test with phenolphthalein is colourless. A pH in the range of 7.8 to 8.2 should be reached.

1.9. Degreasing

An excellent degreasing effect can be obtained in a short bath using no salt, with 0.5-1% of a suitable degreasing agent. At a bath temperture of 30°C/86°F, most of the natural grease will be extracted. Effluent and health problems are avoided because petrol and methyl chloride are omitted. Getting rid of natural grease is also a safeguard against fatty spew, which is a very dangerous hazard since it is usually visible only after garments or shoes are made up. An effective degreasing ensures clean, easy and level dyeing. Degreasing should be carried out before bating, because the action of proteolytic enzymes is reduced by natural grease.

1.10 Rinsing

Rinsing before bating is recommended for the same reason. However, if the degreasing agent RM 3.48, which does not reduce the bating effect, is used, rinsing is not necessary.

1.11 Bating

As a rule, bating is based on medium to strong pancreatic, commercial enzyme preparations, such as the well known Oropon O and OR from Rohm, Darmstadt, W. Germany. Bating is carried out at a pH of 8.2 to 8.5 for 1-3 hours, at a temperature of 30-35°C/86-95°F, with gentle mechanical agitation. The aim should be to obtain a soft grain. The pig grain goes down to the shaft of the bristles. If the grain layer is still too firm and compact, it shows marked rings which spoil the velvety aspect of the suede. During dyeing it may show up as dark spots.

1.12 Rinsing

The goods are rinsed and the bath is then drained completely.

1.13 Fatliquoring before pickling

The tensile strength of the degreased pigskin is increased by fatliquoring before pickling. A specially balanced fatliquoring bath has been developed (RM3.50). The stability to the electrolytes in the pickling bath has to be sufficient. Fatliquors are drummed into the pelt in a short bath.

1.14 The pickle

The pickle is started by adding salt and water in amount which avoid swelling and excessive neutral salts. After 5 min formic acid (most rapidly penetrating acid) is added. In order to obtain a pH of 3.0 to 3.5 during treatment, this addition is often combined with sulphuric acid. If enzymes such as Eeropic DVP (Rohm, Darmstadt, W. Germany) are used to obtain additional softness, the goods are treated for 2-3 hours at a pH of 3.5-3.8. Generally a normal pickle at 30°C/86°F for 1-2 hours is sufficient.

1.15 Glutardialdehyde pre-tannage

Glutardialdehyde pre-tannage is valuable to give garments better stability of shape, more resistance to dechroming during dry cleaning and increased softness. At a pH of 3-3.5, a soft and smooth grain is obtained. For firmer shoe upper leathers, it might be of interest to start with a weaker pickle at pH 4-5 because a harder, possibly shrunken grain is obtained. The goods are drummed for 1 hour with glutardialdehyde.

1.16 Chrome tannage

Masked chrome powders of 25-26% chromic oxide adjusted to 42% basicity are added to the same bath. Chrome salts made of bichromate reduced with glucose and sulphuric acid with 10% chromic oxide, adjusted to 42% basicity, are cheaper and more suitable for mellow leathers. They are used in many tanneries. (Details for the preparation are given in the recipe RM-15CP). 2.5% chromic oxide (of pelt weight) is added in two portions 30 min apart and the pelts are drummed for 2 hours at about 16 rpm.

1.17 Basification

We recommend the use of sodium carbonate in combination with sodium formiate which acts as a buffer. Corresponding to pH 2.5-2.8

1.5% sodium carbonate calc. mixed with
0.2% sodium formiate dissolved in
20 % water at 60°C/140°F, then cooled down to 25°C/77°F

should be used.

This mixture is added in 4 portions at regulated intervals to avoid chrome spots. After each portion, the pH of the bath should be measured:

1st portion added after 10 min pH 3.5
2nd portion added after 10 min pH 3.6
3rd portion added after 20 min pH 3.9
4th portion added after 20 min pH 4.0 to 4.1

In order to test the heat stability of the leather, the boiling test for 1 min at 100°C/212°F is carried out. The leather should not shrink more than 10-15%.

Drumming is continued for 3 hours reaching a temperature of 35-40°C/95-104°F and the skins are then horsed up overnight and preferably left on the horse for 24 hours.

1.18 Selection in the blue:

Garment suede or nubuk
Shoe suede or nubuk
Nappa with a good grain
Gloving leather with a good grain
Linings out of poorer hides.

1.19 Samming

It is important to sam with high pressure to ensure that splitting and shaving guarantee even substance (pressure 25-30 tons). As the butt part of the pig is firmer in structure, the water cannot be removed sufficiently at low pressure. Even if the control of thickness after splitting and shaving seems to be correct, it will be noticed that this may not be the case after retannage for the reasons mentioned. The use of a modern samming machine (Rizzi, Modena, Italy or Turner, Oberursel, W. Germany) with a setting out cylinder is therefore very important.

1.20 Splitting

Here again precision is most important. Reputable machines are made by Mercier, Onnonay, France and Turner, Oberursel, W. Germany. According to the type of suede or nubuk, heavy or light, the goods are split for garments to 0.9 mm and for shoes to 1.3-1.6 mm.

1.21 Shaving

Once more, the machine is of primary importance. Machines approved in practice are: Rizzi Model RLA 1700 from Rizzi, Modena, Italy and DMD RM 1400 mm from the Badische Maschinenfabrik, Karlsruhe, Durlach, W. Germany.
Shaving must be done with high precision thus avoiding marks and "steps'.
Garment suede to 0.6-0.7 mm (butt 0.6, neck 0.7 mm)
Garment nubuk to 0.9 mm on the flesh side,
and then to 0.7-0.8 mm on the grain side.
Shaving the grain side is a matter of know-how. The overall aspect of the skin, depth of grain and damage have to be considered. The grain has to be cut off all over the skin, but only as much as is essential. Careful control here will upgrade selection considerably. Provided tensile strength is sufficient, pig nubuk gives a more regular, finer nap than suede. This fact is an important point for upgrading the selection.

Pig nubuk for garments can be kept at 0.7 or even 0.9 mm as the nubuk is softer. Further, we should make it clear that it looks not like the short fibred nubuk of calf. Pig nubuk looks like a fine suede, showing fewer but more regular and finer pig pore structures, with a more even fibre length all over the skin. This is a very important point for leather garment manufacture. Treatment according to recipe RM-15 CP achieves a high silk sheen producing a very valuable leather for elegant garments.

The shaving strength for shoe suede and nubuk may vary. According to the skins and type of article, it is in the range of 1.2-1.6 mm for suede and 1.3-1.6 mm for nubuk. The shaving strength for nappa may be 0.8-1.2 mm, for gloves 0.8 mm and for linings 0.9-1.1 mm.

2 Retannage, neutralisation and fatliquoring

Retannage is most important in order to obtain reproducible shades within the lot and from lot to lot. As a result of selection, skins of different tannage lots, even of different tanneries, with variations of tannage, form new production lots.

Unless a good retannage is carried out there will be as many shades as skins from different lots in this new lot. This would be an impossible state of affairs. In addition, skins from one basic pre-tannage up to the wet blue, can be made into different leathers, by specialised retannages. The additional expenditure is therefore technically and commercially well justified.

2.1. Chrome retannage of garment suede and nubuk
(based on the shaved weight)
After washing with RM 3.48, a chrome retannage in a short bath with a reduced chrome liquor of 50% basicity offering 1.5-2.5% chromic oxide should be applied. Instead, a masked and basified chrome salt such as Chromitan MS (B.A.S.F. Ludwigshaker, W. Germany) can also be used. The chrome is drummed into the leather for 2 hours until a pH of approx 3.8 is reached.

2.2. Resin retannage

A short wash is followed by a retannage with a resin, such as Tergotan GS, to fill the lower parts of the skins.

2.3. Neutralisation

Neutralisation to pH 5.8 all through the skin is then carried out in the same bath and subsequently the skins are washed twice.

2.4. Fatliquoring

Studies have shown that the fatliquor composition has a specific influence on the closing up of pig suede and nubuk, the handle, and appearance of pig pores and of course on the dyeability of suede. The amount of fat to be used has to be evaluated by a series of comparative tests. Based on the shaved weight, 3-9% of 100% fatty matter is applied depending on the degree of liming, bating and the article to be produced. The type of emulsion, its stability and the kind and strength of charge - anionic, cationic, non ionic or amphoteric-influence the distribution of the fat. The degree of fixation is to a large extent dependent on the ratio of the charge and its emulsifiable part to the ratio of the so-called neutral fats. In addition, other factors, such as temperature, influence this matter. Fatliquors should not have a tendence to spew, as for instance neats-foot oil. In order to prevent crystallisation of fatty acids originating mainly from natural grease or from fat components added, safe-guards should be built in. A greasy nap has to be avoided. Garment producers require a soft but ungreasy touch preferably with a high silk sheen on all

suedes. An even distribution of fats in butt and neck is most important and fatliquors should be made up to exhaust the bath in not less than 30-45 min in order to achieve this. Drumming for 90 min is preferable at a temperature of 40°C/104°F, which is sufficient to ensure even distribution. The addition of fillers is important to level out differences of tight and loose structure. ® Relcasyn Filler F has been found very useful for this purpose. The levelness of the dyeing is not affected. On the contrary, more even buffing is obtained which is very important for pig suede and nubuk. Better levelness and better shade conformity from butt to neck is thereby achieved.

2.5. Cationic topping

A cationic topping such as 0.5% ® Catalix GS, is very useful since it helps to acquire and maintain a soft grain. When added to the exhausted fatliquoring bath, Catalix GS helps to complete the pick up of anionic fatliquor residues and prevents penetration of the paste into the leather during paste drying.

3 Drying methods

3.1. Paste drying

Paste drying is recommended in order to achieve:
- a flat, even leather for buffing, and more feetage,
- a flat leather for cutting up into garments or shoe shafts.

3.2. Nailed to wooden boards

The leather can also be hung up to dry, it is then conditioned, staked and nailed under little tension onto wooden boards for final drying at 40°C for 30-40 min.

3.3. Vacuum drying

Preliminary vacuum drying to about 22-25% residual moisture content with subsequent toggling or nailing before buffing can also be applied. This method is particularly useful when pigskin suedes of good grain are finished to be used as garment nappa.

4 Buffing

4.1. Buffing method

The dried skins are kept flat, the edges are clipped off and then they are buffed as indicated in the recipe RM-15 CP. It is very important to keep to the chosen buffing system and to prevent buffing marks, due to stops and undue pressure. Although not easily visible while buffing, these marks will show up very distinctly as lines and squares of different shades, due to the fact that the nap has fibres which vary too much in length and direction. For suede and nubuk, a buffing paper No. 180 and a buffing machine of the Fulminosa(Turner, Oberursel, W.Germany)type are used. Nubuk is first buffed on the flesh side and then on the grain side.

4.2. Dusting off

Brushing out is done by machine. The skins are then clipped if necessary.

4.3. Selection for dyeing

The skins are sorted out according to thickness, damage and structural quality and standard lots are prepared for dyeing. If reproduciability is to be ensured, footage and weight from lot to lot should not vary more than 3-5%.

5 Drum dyeing

The main factors, ensuring level dyeing, to be mentioned are:
- sufficient opening of the fibre structure in liming, bating and pickling
- very thorough and even degreasing
- regular distribution of tanning agents (chrome salts, resins, vegetable or synthetic tannins)
- good neutralisation and uniform distribution of the fatliquors
- uniform thickness of fibre nap
- good affinity of the leather to the dyestuffs.

The selected dyestuffs should be of appropriate, similar affinities. In a few cases only, a single dyestuff can be used. Whenever 2 to 4 dyestuffs are involved in shading, they must behave similarly regarding adsorbtion and migration properties in order to achieve level shades, the desired penetration and at the same time good fixation. In order to avoid fading off shade, the light fastness properties should be considered. The minimum light fastness

ratings should be 2-3 for pastel and 3-4 for medium and dark suedes or nubuk for garments. Fastness to light is less critical for shoes. Since fastness to light is highly dependent on the fastness of the leather itself, tanning and fatliquoring agents must be selected accordingly. Further, it must be borne in mind, that the light fastness is directly dependent on the concentration of the optically active part of the dyestuff on the leather surface. For example, pastel shades superficially dyed with 0.3% of a dyestuff will not only fade but also turn yellow when the garment is ironed before sale. Ironing can also bring about a darkening of the shade caused by migration of unbound fatty components to the leather surface, which can lead to a greasy aspect or even spew. The adhesion of vulcanised soles on shoes will also be impaired by fat migration to the adhering surface. On wear, such leathers will pick up dirt easily and give suede and nubuk a bad reputation with the consumer. The dyeing process in which agents, such as Silk Finish LB and Catalix GS are added, to give suede and nubuk a silky sheen, therefore has to be a carefully balanced system.

Fixation of dyestuffs with formic acid must be done step by step in order to avoid sudden precipitation in the preliminary stages, or too high penetration in the final phases of dyeing (see examples of pastel (F 47), medium (F 45) and dark shades (F 49 and F 57).

The dyeing technique

Drum machines with pegs and or shelves such as the new Coretan (Trockentechnik GmbH, Homberg/Hiederrrhein, W. Germany) and Hagspiel (Wilhelm Hagspiel KG, Ludwigsburg, W. Germany) machines are recommended. The Coretan and Hagspiel machines both work on the same principle as the textile washing machine. The drumming effect of both machines is better than in the conventional drum. Operation time can be shortened by up to 20-30%. Reproduciability is superior due to better and more frequent contacts between leather and dyebath. The punch card control equipment is another asset which safeguards reproduciability. An important factor for thin garment leathers, which are becoming more and more popular, due to their lightness and elegance is, that less leather is torn to pieces.

Wetting back is an important preliminary operation to dyeing. Complete rewetting can be achieved within 40-60 min at 60°C/140°F by applying ^{R} Tergolix A or 0.3 - 0.5% RM 3.48 (on dry weight) and ammonia. As the adsorption of 70 % of the dyestuff takes only 3-5 min
conditions are unfavourable for levelness and penetration. The affinity of the dyestuff to the leather must therefore be reduced at the beginning. Depending on the shade to be obtained, lower temperature, higher pH and, most important of

all, auxiliaries selected for specific purposes at well chosen quantities have to be used.

If penetration is necessary, as for pastel shades, ® Cartan O Liquid and agent HM 3.71 are used in a pretreatment at 40°C/104°F with a pH of 6.5. After 20 min, the Derma dyestuffs of medium affinity are added. (see recipe 47). Rather than reduce the quantity of dyestuff, the exhaustion of the bath should be controlled and slowed down by the addition of HM 3.71 and Carton O Liquid for very light shades, in order to maintain sufficient light fastness for garments.

For shoes, the quantity of dyestuff may be reduced with less risk. Dermagen PR is an effective agent to avoid the emphasis of damage in leather, particularly on the grain side of nappa for instance.

Sandwich dyeing should not be used for very light shades since reproduction is less easy. For medium and dark shades, sandwich dyeing has many advantages. In order to achieve penetration, reduced amounts of Cartan O Liquid and HM 3.71 are applied in the first phase of dyeing at 40°C/104°F as shown in recipes F 45 and F 49. By adding Dermagen DM, a cationic agent which increase affinity, to the exhausted bath containing the acidified leather, depth of shade is obtained. The simultaneous addition of Catalix GS, a cationic product, gives softness and lustre. The richness of shade is obtained by the second portion of dyestuff applied in a new bath at 60 C/140 F, because it remains more on the acidified, cationic leather surface. It is further enhanced by a finishing bath containing Silk Finish LB or by an impregnation with ® Cerol EWL and Silicone emulsion WS 60 (Wacker, Munich, W. Germany).

The dyeing recipes mentioned produce current fashion shades in

5.1. pastel
5.2. medium
5.3. dark and
5.4. black tones.

Further details of procedure are given in the recipe section.

Types of dyestuff

® Derma dyestuffs are acid dyes with good level dyeing power and good general properties on suede, nubuk and nappa.

® Derma Light dyestuffs are particularly interesting for pastel shades, combining good leveling, washing and light fastness properties, although penetration is not as good.

Considering their properties, combinations of Derma and Derma Light dyestuffs are also possible.

A selection of dyestuffs which facilitate dyeing other desired fashion shades on pig leather is given in the following lists.

DERMA dyestuffs	light fastness (8% dyestuff)
Derma Yellow GL	4-5
Derma Yellow 2G	4
Derma Orange 2R	3-4
Derma Red BG	3
Derma Blue R	3
Derma Green 2G	3-4
Derma Olive 9R	4
Derma Yellow Brown 9S	4
Derma Yellow Brown R	4-5
Derma Havanna R	4
Derma Havanna G	4-5
Derma Brown D3G	4-5
Derma Brown DR	4-5
Derma Dark Brown DG	4
Derma Bordeaux V	4
Derma Brown 5G	4-5
Derma Brown 3GL 250%	6
Derma Brown HG	4
Derma Brown RB	4
Derma Brown G	3-4
Derma Brown 2G 130%	4
Derma Brown D2GL	5
Derma Brown DGVL	5
Derma Grey LL	5
Derma Grey G	3
Derma Carbon RBL	5
Derma Carbon BF	3

DERMA LIGHT dyestuffs	light fastness (1% dyestuff)
Derma Light Yellow 3GL	4
Derma Light Yellow GLN	4-5
Derma Light Yellow 2RL	5
Derma Light Orange RLN	2
Derma Light Red BL	3
Derma Light Red 2GL	3
Derma Light Bordeaux RL	4-5
Derma Light Violet RL	3-4
Derma Light Blue GL	3
Derma Light Green 3GL	3
Derma Light Green 5GL	2
Derma Light Olive 2GL	3
Derma Light Brown 2GL	2-3
Derma Light Brown GRL	3-4
Derma Light Grey BL	2-3
Derma Light Grey 2BL	2-3
Derma Light Grey NG	3-4
Derma Light Black BGL	3
Derma Light Black BRL	4

RELCASOL dyestuffs	light fastness (1% dyestuff)
® Relcasol Brown GL	5

Fastness to washing

Cationic fixation on the basis of ® Dermafix WE, which renders dyestuffs insoluble, achieves fastness to luke warm washing with synthetic detergents.

5.5 Water repellent and oleophobic treatments

Water repellent and oleophobic treatments are relatively costly processes and therefore reserved for leather which has to meet special requirements, such as golf shoes.

Different methods and products such as fluor chemicals, chromium, zirkonium or aluminium salts of fatty acids or paraffins are used. The previous fatliquoring process must be kept at the lower level of 3-5% (100% fatty matter) to enable good adsorption of these products when applied in amounts of 3-10% on dry weight.

Very good hydro-and oloephobic properties are achieved by fluor chemicals such as 10% Scotchgard FC 146 (3 M, USA) (on dry weight). Suede or nubuk, however, acquires a slightly harsh handle and is therefore more useful for shoes and sportswear. Water repellency with a soft handle is obtained by applying Ⓡ Ombrophob C or Cerol EWL combined with Silicone emulsion WS 60 (Wacker, Munich, W. Germany). Further details are given in the examples of hydrophobic treatments A, B and C for use with recipe F 47.